





Chapter 15: Search And Rescue

Overview

Introduction

This chapter provides a general overview of the Search and Rescue (SAR) organization and basic skills and knowledge required to conduct SAR operations as a boat crew member.

A successful rescue mission depends on correct search planning and execution. The dramatic image of a Coast Guard boat battling wind and sea in the dead of night to save a helpless mariner is only part of the story. The rest of the story involves collecting essential information, planning the correct response, assessing the risk, selecting the proper search and rescue unit, and exercising proper safety precautions.

NOTE &

Specific policies, guidance, and technical information for SAR operations are in the National Search and Rescue Manual COMDTINST M16120.5 & 6, and the Coast Guard Addendum to the National Search and Rescue Manual COMDTINST M16130.2 (series).

In this chapter

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Coast Guard Boat Crew Seamanship Manual





Section A. Organization and Responsibility

Overview

Introduction

The boat responding to a SAR incident is an operational facility that is one part of the overall SAR system. To enable the boat to effectively perform its operation as a search and rescue unit (SRU), an organization and assignment of responsibilities have been established on a national and international level. This section presents SAR information on the national system.

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Coast Guard Responsibility

A.1. General

SAR coordination responsibility in the United States is divided between the Air Force and the Coast Guard. The Air Force is responsible for inland SAR. The Coast Guard is responsible for maritime SAR which includes:

- interior river systems,
- inland waterways,
- coastal waters, and
- parts of the high seas.

Memorandums of understanding (MOU) with Guam, Alaska and Hawaii, state that Coast Guard resources are also responsible for land SAR in these areas (only portions of Alaska).

A.2. The law as it applies to the Coast Guard

The Coast Guard promotes safety on, over, and under the high seas and all waters subject to the jurisdiction of the United States. U.S. law states that the Coast Guard **shall** develop, establish, maintain, and operate search and rescue facilities and **may** render aid to distressed persons and protect and save property. It also states that the Coast Guard may utilize its resources to assist other federal and state entities.

A.3. Areas of responsibility

Maritime SAR is divided into two major areas of responsibility (AORs):

- Atlantic maritime region
- Pacific maritime region

The two regions are further subdivided into smaller geographical AORs for better distribution and management of personnel and facilities.

A.4. Objectives

Two SAR program objectives are of direct importance to boat crews:

- To minimize loss of life, personal injury, and property loss and damage in the maritime environment.
- To minimize search duration and crew risk during SAR missions.



A.5. SAR facts

The majority of SAR cases occurs within 20 miles of shore. Coast Guard helicopters and boats, our primary quick response assets, handle most of these cases. About 90% of all cases do not require searching. A small percentage of cases involve minor searches (less than 24 hours) and an even smaller percent of these cases involve major searches lasting over 24 hours. Despite being a small percentage of SAR operations overall, the annual cost for searches is millions of dollars. Boats may conduct operations with helicopters, especially searches or medical evacuations (MEDEVACs). Chapter 18, Air Operations, provides more information on operating with aircraft.



Search and Rescue Coordination

A.6. General

Your boat is part of a unit; your unit is part of a group; your group is part of a district; and your district is part of an area. Each link going up this chain of command controls more SAR resources and has wider geographic responsibility than the link below it. The SAR system has three levels of coordination - the SAR coordinator, the SAR mission coordinator, and the on-scene coordinator.

A.7. SAR Coordinator (SC)

The Coast Guard is designated **SAR coordinator** (**SC**) for the Maritime Area and the Air Force for the Inland Area. Coast Guard area commanders are designated SCs for each of the two maritime SAR regions and so are district commanders for their SAR regions. The SCs are the top level SAR managers. The SC is responsible for:

- Establishing, staffing, equipping, and managing the SAR system
- Establishing rescue coordination centers (RCCs)
- Providing or arranging for SAR facilities
- Coordinating SAR training
- Developing SAR policies

A.8. SAR Mission Coordinator (SMC)

Each SAR operation is carried out under the guidance of an **SMC**. The SMC is usually the district RCC or the Group (activity) operations center (OPCEN). The SMC has several duties and responsibilities:

- Obtain and evaluate all data on the emergency.
- Dispatch search and rescue units (SRUs) based on this information.
- Develop search plans which include determining limits for the search area, selecting the search pattern, and designating the onscene coordinator (OSC).
- Control the SAR communication network for the assigned mission.
- Monitor progress of the SAR mission and request additional SAR resources as necessary.



A.9. On-scene Commander (OSC)

The **OSC** Is designated by the SMC to coordinate the activities of all units when two or more SRUs are on scene for the same incident. The first unit on scene usually assumes OSC until the SMC directs that the person be relieved. The OSC should be the most capable unit, considering SAR training, communications capabilities, and the length of time that the unit can stay in the search area.. As the subordinate of the SMC, the OSC has several duties and responsibilities. These are:

- Inform the SMC through periodic situation reports (SITREPs)
- Coordinate the efforts of all SRUs on scene
- Implement the search action plan from the SMC
- Control all on-scene communications between those SRUs
- Monitor the endurance of all SRUs and call for replacement units as needed
- Provide initial briefings and search instructions to arriving SRUs

A.10. Search And Rescue Unit (SRU)

An **SRU** is a unit with trained personnel and provided with equipment for SAR operations. The **SRU** responsibilities include:

- Efficiently execute assigned SAR duties.
- Establish and maintain communications with the OSC or SMC, as appropriate, prior to arriving on scene and until released from the case.

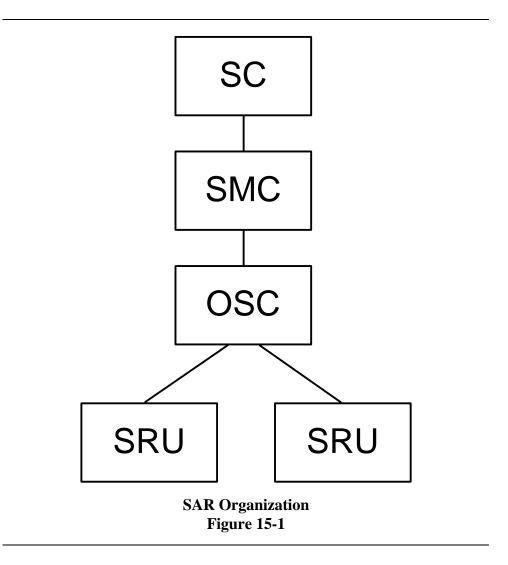
A.10.a. Reporting

Unless you are designated OSC, or are the single SRU on scene, you will report to the OSC. If you are designated OSC or are the single SRU on scene, assume the duties of OSC and report to the SMC.

A.10.b. Communication

Communications and information flow is critical to good SAR planning and conducting of SAR operations. SRUs must continually keep the OSC, or if an OSC is not assigned, the SMC informed of any changes on scene so that proper, timely, and accurate changes can be made to the search plan (See Figure 15-1).







Section B. SAR Emergency Phases

B.1. General

Upon receiving an initial report of a distress situation, the SMC should evaluate all available information and, considering the degree of emergency, declare a SAR emergency phase. A boat underway may take these initial steps to respond as the SMC begins work on a search action plan, if needed.

B.2. Emergency phases

Three emergency phases have been established for classifying incidents and to help in determining the actions to take. These are:

- Uncertainty Phase
- Alert Phase
- Distress Phase

Emergency phases are based on the level of concern for the safety of persons or craft which may be in danger. Each phase requires the collection of data that can assist in determining proper response actions. The emergency phase may be reclassified by the SMC as the situation develops. Also, if sufficient information is received from initial, or early reports, one or more phases may be skipped in determining the proper phase for a particular case. The ultimate action could be immediate dispatch of an SRU. Everything possible must be done to make certain that a unit sent on a SAR case is the proper response.

B.3. Uncertainty phase

An **uncertainty phase** exists when there is knowledge of a situation that may need to be monitored, or have more information gathered, but does not require dispatching resources. When there is doubt about the safety of an aircraft, ship, or other craft or persons on board, or it is overdue or failed to make an expected position report, the situation should be investigated and information gathered. The key word is **"doubt."** A preliminary communications search (PRECOM), is normally conducted during the uncertainty phase. The PRECOM is conducted by contacting facilities or agencies within a specific area to either locate the vessel or determine if the vessel has been seen.



B.4. Alert phase

An **alert phase** is assigned when an aircraft, ship, or other craft or persons on board are having difficulty and may need assistance, but are not in immediate danger. Apprehension is usually associated with the Alert Phase, but there is no known threat requiring immediate action. SRUs may be dispatched to provide assistance if it is believed that conditions might get worse. For overdue craft, the Alert Phase is considered when there is a continued lack of information about its position or condition. The key word is "**apprehension.**" An extended communications search (EXCOM) is normally conducted during the alert phase. The EXCOM consists of extensive and repeated attempts to communicate with the missing vessel. The SMC may direct SRUs to conduct an EXCOM, this usually means you must try to establish radio contact with the vessel every four hours for a 24-hour period. Boat may also be deployed to check out any leads.

B.5. Distress phase

The **distress phase** when there is reasonable certainty that an aircraft, ship, or other craft or persons on board is in danger and requires immediate assistance. This includes a direct report of an emergency or the continued lack of knowledge about a vessel's progress or position. The key word is **''danger.''** SRUs are normally dispatched when this phase is reached.



Section C. Legal Aspects and U.S. Coast Guard Policy

Introduction

Numerous legal issues affect SAR. This section briefly covers situations that you should be aware of and general Coast Guard policy guidance . These issues are covered in greater detail in your district operation plan (OPLAN) or standard operating procedures (SOP).

In this section

These items are discussed in this section:

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Flare Incidents	15-14
Hoaxes and False Alarms	15-15
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SAR Agreements

C.1. General

"SAR agreements," formal written documents, are used to resolve coordination problems such as guidance for entering another AOR or providing SRUs to assist another agency or country. These agreements may be at the local level or on an international level. Check local regulations concerning the effect that any treaty or SAR agreement may have within your AOR. Each nation has final right to regulate entry into their territory regardless of treaties that have been signed. Always be familiar with current policies before conducting SAR outside your normally assigned AOR.



Distress Beacon Incidents

C.2. General

Distress beacons are one of the most important tools available to people in distress for assisting SAR authorities. The various types of distress beacons and their proper use are described in *the National Search and Rescue Manual*. Additional policy and general information are provided in the *Coast Guard Addendum to the National Search and Rescue Manual*.

C.3. General considerations

Many ships and commercial fishing vessels are required to carry an Emergency Position Indicating Radio Beacon (EPIRB); recreational boats are not required but are strongly encouraged to carry them. The original EPIRB, just like the aeronautical version (Emergency Locator Transmitter or ELT) operated on the 121.5 MHz frequency. However, the 406.025 MHz EPIRB and ELT were developed for satellites to detect these distress alerts. As implied, the receipt of a beacon alert is considered a distress. The response for 406 varies slightly form the 121.5 (see CG Addendum). The increased reliability of the 406 over the 121.5, due to its ability to transmit a data string of identification and contact information, and the sole use of the 406 MHz frequency for distress alerting, permit an immediate response by SAR forces.

C.4. Reports of beacon alerts

Reports of audible beacon alerts indicate a beacon has been activated. SAR response to an audible beacon signal should be similar to the type of response provided for orange or red flare sightings, discussed later in this chapter. In cases where Coast Guard resources hear the beacon, they normally respond immediately to determine the signal source. Most other audible signal reports come from aircraft.

NOTE &

EPIRBs are distress beacons. These beacons shall not be used as datum marker buoys. The beacon's signal may prevent another distress beacon from being properly tracked or reported.



Flare Incidents

C.5. General

The Coast Guard responds to many **flare sightings**. Red and orange flares are recognized around the world as marine and aviation emergency signals and must be treated as a distress.

C.6. Considerations

The nature of flare distress signaling makes planning and execution of searches difficult due to the wide variation of flare types, possible altitudes, skill and position of the reporting source/observer, weather, and many other factors. For this reason, the accuracy of the information received from the reporting source and/or observer is critical. For example, a hand-held flare in a recreation boat seen on the horizon by a beach observer will be approximately 4 miles away while a parachute flare rising to 1200 feet and seen on the horizon by the same beach observer could be more than 30 miles away. As with all SAR cases, a prompt, thorough, and proper response, including a thorough debrief of the reporting sources(s), yields the best chance for a successful rescue.

C.7. Reports of flare sighting

It is critical that correct, descriptive, and accurate information be obtained from persons sighting a flare. This requires careful and thorough questioning of the reporting source. The data gathering process requires patience and good interpersonal skills, since reporting sources are rarely familiar with the terms or procedures used by the Coast Guard when investigating flare sightings. A flare reporting checklist must be used to ensure all the proper information is obtained.

Additional information on flare signals and sightings is located in the *Coast Guard Addendum to the National Search and Rescue Manual.*



Hoaxes and False Alarms

C.8. General

False alarms and hoaxes waste valuable operational resource time and dollars, frustrate both search controllers and those required to respond, and may adversely affect the Coast Guard's ability to respond to real distress calls. It is often very difficult to determine with certainty whether an incident is a false alarm, hoax, or real distress due to sketchy and/or contradictory information.

C.9. Hoax

A hoax is a case where information is reported with the **intent to deceive**.

C.10. False alarm

A false alarm is when someone or something reported to be in distress is confirmed to be not in distress and not to be in need of assistance. In a false alarm case, the reporting source either misjudged a situation or accidentally activated a distress signal or beacon resulting in an erroneous request for help, but **did not deliberately act to deceive.**

C.11. Coast Guard response

Coast Guard units shall respond without delay to any notification of distress, even when a false alarm or hoax is suspected. Until proven differently, these cases should be treated as if they are real distress cases. A distress call which "sounds like a hoax" shall not be merely dismissed without further action. A distress shall be considered to exist until the case is closed, suspended, or downgraded by proper authority.



Maritime SAR Assistance Policy

C.12. General

The Coast Guard's primary concern in any SAR operation is that proper, timely, and effective assistance be provided. A key issue is that **it is always a Coast Guard priority to remove people from danger**. When commercial assistance resources are available or may be operating within your AOR, particular guidelines apply depending on the specific situation. These guidelines are published as the Maritime SAR Assistance Policy (MSAP) in the *Coast Guard Addendum to the National Search and Rescue Manual*. More specific guidance is available in your district OPLAN or SOP. The four paragraphs that follow outline some of these guidelines.

C.13. Distress

Immediate response will be initiated for any situation when a mariner is known to be in imminent danger. This response may be provided by regular Coast Guard resources, Coast Guard Auxiliary resources, or resources belonging to other federal, private, state, local, or commercial entities; volunteers or good samaritans . The SMC may use all sources of assistance in a distress situation without concern for conflict with private enterprise.

C.14. No conflict concern - any situation

Private organizations (non-commercial), state and local organizations, and Good Samaritans are acceptable sources of SAR assistance. When volunteered or available, their help can be used without any concern for conflict with commercial providers. However, if their expertise is unknown, the SMC shall more closely monitor the assistance provided. This is especially true in the case of Good Samaritans.

C.15. Non-distress cases

When specifically requested assistance, such as a commercial firm, marina, or friend is not available, a marine assistance request broadcast (MARB) may be broadcast. If a commercial provider is available and can be on scene within a reasonable time (usually one hour or less) or an offer to assist is made by any of the resources listed in the previous paragraph, no further action by the Coast Guard, beyond monitoring the incident, will be taken.



For a non-distress situation where an Auxiliary facility discovers a vessel requesting assistance but which has not contacted the Coast Guard, refer to the Coast Guard Addendum to the National SAR Manual and the Auxiliary Operations Policy Manual for guidance.

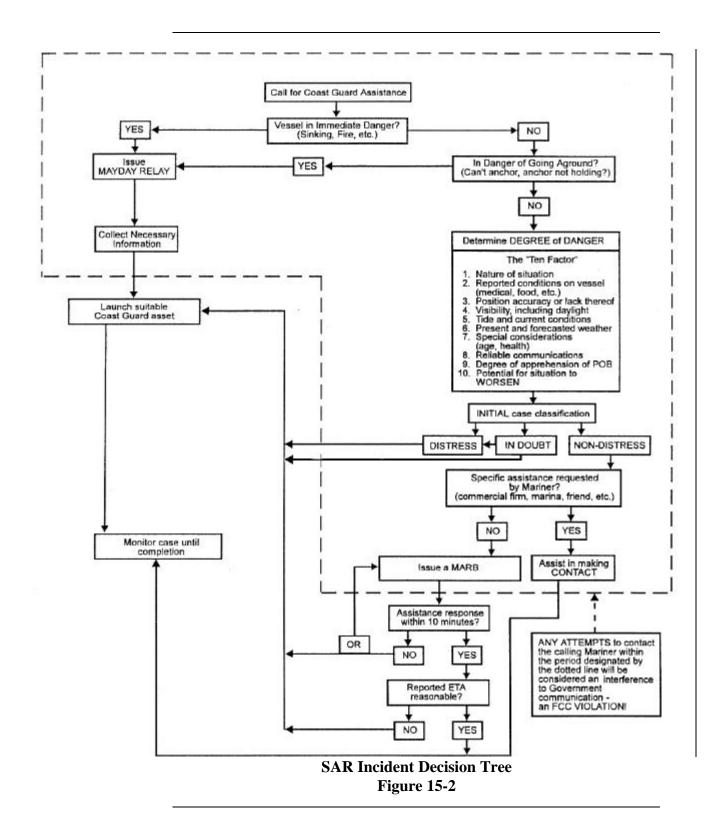
NOTE &

If the commercial provider and the boater in need of assistance do not reach agreement, the Coast Guard must continue to monitor the case.

C.16. Non-distress use of Coast Guard resources

Coast Guard resources normally do not provide immediate assistance in non-distress cases where there is alternative assistance available. The Coast Guard both supports efforts of private enterprise and encourages volunteerism in assisting mariners. Coast Guard resources will not unnecessarily interfere with private enterprise. A Coast Guard resource may assist in a non-distress situation when no higher priority missions exist and no other capable resource is reasonably available (See Figure 15-2).







General Salvage Policy (Other Than Towing)

C.17. General

Coast Guard units and resources are employed for SAR, not for salvage operations. However, if circumstances dictate that salvage operations must be undertaken, follow the guidance in *the Coast Guard Addendum to the National Search and Rescue Manual*. Additional guidance may be found in district and unit SOPs.

C.18. General considerations

During a SAR operation, boat crew and SAR planners should be alert to see if the situation is changing:

- Has the incident changed from a distress (e.g., people are rescued) to an effort that is now more of a salvage operation?
- Will salvage by the Coast Guard reduce the threat of loss of life or the vessel becoming a hazard to navigation? What can be done to prevent a worsening condition or total loss of vessel?
- Is there a threat of injury to boat crew members or damage to the boat that would prevent the SRU from responding to another distress?

C.19. Commercial salvage

When **commercial salvers** are on scene performing salvage, Coast Guard units may assist them if the salver requests, and the assistance is within the unit's capabilities. However, salvage operations shall be performed only at the discretion of the unit CO/OinC. When no commercial salvage facilities are on scene, Coast Guard units may engage in salvage, other than towing, only when such limited salvage operations (e.g. ungrounding, pumping, damage control measures, etc.) can prevent a worsening situation or complete loss of the vessel. Coast Guard units and personnel shall not unduly hazard themselves at any time by performing salvage operations.

NOTE &

Firefighting policy is discussed in a separate chapter to this Manual.



C.19.a. Small craft

This policy applies to small craft which need salvage other than towing. However, when no commercial salvage companies are available within a reasonable time or distance, the district commander may modify the policy to provide for refloating a grounded boat which is not in peril of further damage or loss if:

- the Coast Guard units are capable of rendering the assistance;
- the owner requests the assistance and agrees to the specific effort to be made; and
- Coast Guard units and personnel are not unduly hazarded by the operation.

C.19.b. Operator insistence

Occasionally an operator will insist the Coast Guard take action, such as pulling a vessel from a reef, which the Coast Guard personnel on scene consider unwise. The Coast Guard is under no obligation to agree to any such request or demand. If a decision to comply with such a request is made, it should be made clear to the operator that he is assuming the risk of the operation and the fact that the action is undertaken at his request against Coast Guard advice should be logged.



General Issues

C.20. Public relations

A SAR operation often creates great interest with the general public and with radio, television and newspapers. Your responsibilities as a boat crew member do not include providing information to the news media. To avoid wrong information and misunderstandings for the public, you should direct all inquires to your Officer Of the Day (OOD), Officer in Charge (OinC), or Commanding Officer (CO). Relatives of missing persons may also seek information. You should show proper concern for their stressful situation but also refer them to the OOD, OinC, or CO for any information.

C.21. Searches for bodies

Chapter 4 of *Coast Guard Regulations* states that, "when it has become definitely established, either by time or circumstances, that persons are dead, the Coast Guard is not required to conduct searches for bodies. If, however, requests are received from responsible agencies, such as local police, military commands, etc., Coast Guard units may participate in body searches provided that these searches do not interfere with the primary duties of the units." Since boats are not provided the specific gear nor training to conduct searches for bodies, their involvement is usually either as a surface search unit or support platform for other agencies to use their equipment.

C.22. Trespassing

SAR personnel should obtain permission from the owner or occupant prior to entering private property. If this is not possible, then permission must be granted by your operational commander **before** entering private property. Only when saving a person's life, can immediate action be taken.





Section D. SAR Incident Information

Overview

Introduction

Once aware of a distress, SAR units attempt to find out as much information about the incident as possible. Standard response procedures and report formats are very important.

NOTE &

Before SAR units are activated, a number of facts about the case must be recorded. These facts fall into two broad categories:

For guidance and recommended format for standard incident checksheets, refer to Appendix E of the Coast Guard Addendum to the National Search and Rescue Manual and your district SOP.

- Initial SAR information
- Additional SAR information

Initial SAR information is very important for several reasons. One use of SAR case information by SAR planners is to categorize the case to determine the most appropriate and effective response to provide. SAR planners use every available piece of information to plan the Coast Guard's response, including determining the type of SRU assigned, when it is dispatched, and what type of equipment is taken to the scene.

In this section

These items are discussed in this section:

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Initial SAR Information	15-24
Additional SAR Information	15-28



Initial SAR Information

D.1. Data collecting and recording

Initial notification that an emergency exists may come from many sources, including:

- relatives may report that a family member is overdue
- "MAYDAY" by radio
- witness to the distress

If the caller seems excited:

Step	Procedure
1	Calm the individual down enough to collect accurate, essential
	information.
2	Be courteous and show concern for the caller and their situation.
3	Be confident and professional, but not overbearing.
4	Speaking calmly will help ease people's concerns and assure them
	that the situation is well in hand.
5	Be prepared to write down information (have checklist and pen
	within reach).

D.2. Communication with the source

It is important to maintain communication with reporting sources, regardless of who they are or how the call was made. Also, keep callers advised of what actions are being taken to resolve the situation they reported.

D.2.a. Radio source

Most distress calls by radio come in on Channel 16, 156.8 MHz. This channel is the maritime VHF-FM international distress and calling frequency. To keep it open for other distresses, the caller is usually asked to move (shift) to a working channel, if possible. Since shifting could result in losing communications with your reporting source, the caller is asked to shift back to channel 16 if no reply is heard on the working channel within five minutes. The transmission may be as follows"

Example: "Vessel in distress, this is Coast Guard Station. Shift and answer channel 21. If no reply is heard on that channel within five minutes, shift back to this frequency, channel 16, over."

"Coast Guard, this is the vessel, shifting to channel 21, out."



D.2.b. Telephone source

If calls come in by telephone, immediately take down the name and number of the person calling. In the event you are disconnected, you will be able to return the call and obtain the needed information. Also try to identify how you may be able to try to communicate with the person or vessel that is reported to be in distress. Cellular telephone numbers, types of radio equipment and frequencies used may help establish communications with the distressed vessel or person.

D.3. Initial information

Once stable and repeatable communications are established, the most vital information to immediately record is:

- Location
- Number of people on board (POB)
- Nature of distress
- Name, radio call sign of distressed craft
- Description of the craft

Response activity can be started once these items are known. Also, realize that this may be the only contact made with the distressed craft or reporting source (e.g., the radio broke, power was lost, or the boat sank).

D.4. Distressed vessel information

The identity of the distressed vessel should be established:

gather and record the same information about the relaying source.

NOTE &

- Vessel name
- Vessel type
- Vessel call sign

Vessel numbers

- Name of person calling
- Number of people on board (POB)
- Condition of all POB

When direct communications with the vessel in distress are not available, that is to say the information about the distressed vessel is being relayed,

In this section, the term "vessel" includes aircraft, person, or any other source of initial SAR case information. In these instances, ALL appropriate identifying information should

be obtained.



D.5. Type of emergency

The nature of the emergency must be clearly and completely understood in order for responding units to be prepared to assist. The emergency may be any **one** of the following, or it may include **many** of these examples, or it may be some other type of emergency:

- Aground
- Sinking
- Collision
- Fire
- Disabled
- Overdue
- Medical

D.6. Location of emergency

The location of the emergency must be clearly established in the most detailed terms possible. This should include any or all of the following, plus all additional information received.

- Position (latitude and longitude) of the incident
- Bearing and distance from the incident to any points of land or landmarks known or observed
- Last known position of the incident or distressed vessel

D.7. Persons on board

- Number of people on board (POB)
- Condition of all POB
- Survival equipment
- Friends/Relatives



D.8. Additional location information

NOTE &

It is important to have all people on board ALL vessels don their PFDs as soon as possible. After the nature of the incident has been completely established, additional information about the location should be gathered. This additional information is needed when determining "datum," the position where the incident occurred or where the search will begin:

- Vessel's course and speed
- Date and time of the last known position
- Length of the time that the vessel has been drifting/disabled/aground



Additional SAR Information

D.9. General

Besides recording the SAR information described above, certain additional information is extremely valuable. Information in this category includes:

- Medical data
- On-scene weather data
- Overdue data

All radio frequencies the vessel can use or monitor, or cellular telephone if used.

D.10. Medical data

If medical assistance is required, collect and record as much of the following additional information as possible. Check lists containing complete lists of information to collect can be found in your district OPLAN or SOP and should be used to avoid missing key information. Addition information includes:

- Patient's name, nationality, age, and sex
- Patient's symptoms and vital signs
- All medication given to patient
- All medication available aboard the vessel

All radio frequencies the vessel can use or monitor, or cellular telephone if used.

D.11. On-scene weather

Additional weather information can be useful. The weather on scene may differ from the weather at your location. **On-scene weather** information is important in determining:

- Type of SRU best suited to respond
- Datum (the probable location of the distressed vessel)
- Emergency phase



D.12. Overdues

Some reports received will involve people or vessels that are **overdue** at some location, but no distress will be evident at that time. Information collected at the time of the initial report may prove invaluable later if a search planning effort is begun.

D.13. Gathering data

Gathering the following type of data will avoid possible delays if the person or vessel does not arrive at the destination and further action is required. Sometimes it becomes difficult to reestablish contact with the reporting source to gather additional information when that information is needed. Data collection includes:

- Period of time the vessel has been overdue
- Vessel's departure point and destination
- Places the vessel planned to stop during transit
- Navigation equipment aboard the vessel
- Survival equipment aboard the vessel
- Number of people aboard the vessel as well as their names, ages, sex, and general health
- Personal habits of the people aboard the vessel (e.g., dependability, reliability, etc.)
- License plate number and description of the towing vehicle and trailer, if the boat was trailered to the departure point
- Communications equipment on board including radio frequencies monitored
- additional points of contact
- Pending commitments (work, appointments, etc.)

Chapter 15: Search and Rescue





Section E. Search Planning

Overview

Introduction

Before SRUs are dispatched, careful planning is needed to accurately determine area where the survivors are or will be located when the boat arrives on scene. Good SAR planning significantly increases the probability of successfully locating and rescuing those in distress. Planning the search involves calculating datum and then outlining the boundaries of the search area. Most search planning would be done by the RCC or the Group OPCEN and results in a search action plan. The boat crew then conducts SAR operations based on this search action plan. However, there may be times where you would have to do basic search planning. Search planning also includes risk management to determine what response, if any, is appropriate and which resources are the right ones to respond.

For more information on search planning, calculation of datum, and the forces that affect datum see the *National Search and Rescue Manual* and the *Coast Guard Addendum to the National Search and Rescue Manual*.

In this section

These items are discussed in this section:

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Search Area Description	15-34
Search Patterns	15-39
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Search Area Coverage	15-53



Datum

E.1. General

The term "datum" refers to the most probable location of the distressed vessel, corrected for drift over a given period of time. Depending on the information available and its accuracy, datum may be:

- A point
- A line
- An area

As the case develops, datum must be corrected to account for wind and current. Datum is established by the SMC or OSC.

E.1.a. Datum point

A point at the center of the area where it is estimated that the search object is most likely located.

E.1.b. Datum line

If you cannot pinpoint the location of a distressed boat, you may be able to determine its intended trackline or a line of bearing. The **datum line** is the intended trackline or line of bearing plotted on the chart. Without more information, it is assumed that the distressed vessel may be anywhere along the length of the plot. The line could also be a direction finding line of position.

E.1.c. Datum area

When you cannot determine either the exact position of the distress or a datum line, a **datum area** is developed based on many factors, but including as a minimum:

- Fuel endurance of the vessel in distress
- Vessel's maximum cruising range
- Wind and currents which affect the search object
- Operator's intentions

E.2. Forces affecting datum

As time progresses, datum must be corrected to compensate for the effects of wind and current. Some of the many natural forces which affect a search object are listed below.



E.2.a. Leeway

Leeway is the movement of a search object through the water. Leeway is caused by local winds blowing against the exposed surface of the vessel.

E.2.b. Local wind driven current

Wind blowing over the water's surface tends to push the water along in the same direction the wind is blowing. This wind current affects the movement of a search object in open waters. Wind-driven current may not be a factor when searching in coastal waters, small lakes, rivers, or harbors because nearby land masses may block or reduce the effect of wind.

E.2.c. Sea current

Sea current refers to the movements of water in the open sea.

E.2.d. Tidal current

Tidal current is caused by the rising and falling of tides.

E.2.e. River current

The flow of water in a river is called **river current**. These currents can quickly move a search object over a long distance. This should be considered in rivers or at the mouth of a large river.

NOTE &

Drift, in search planning, is the movement of a search object caused by all of the environmental forces.



Search Area Description

E.3. General

The search area is a geographic area determined by the SMC as most likely to contain the search object. The amount of error inherent in drift calculations and navigational capabilities of both the distressed craft and the SRU ar`e used to calculate a search **radius**.

NOTE &

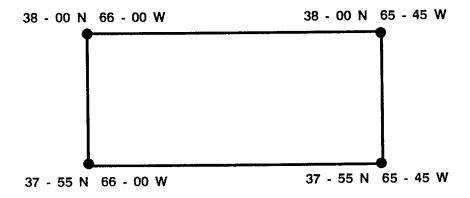
When response times are short, the SMC may use a standard radius, adjusted for physical surroundings. Where a search can begin in less than six hours, a six mile radius around a datum adjusted for drift is usually large enough to include most search objects.

E.4. Methods

Search areas may be described by many methods, including the following:

E.4.a. Corner point

In this method the latitude and longitude (or geographic features) of each corner of the search area are given (See Figure 15-3).

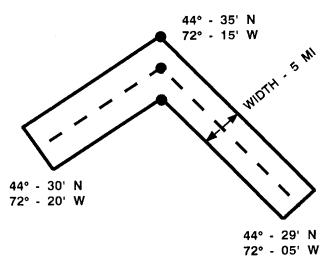


Corner Point Figure 15-3



E.4.b. Trackline

The latitude and longitude of the departure point, turn points, and destination point are given with a specific width along the track (See Figure 15-4).

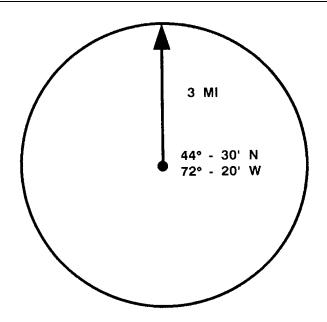


Trackline Figure 15-4

E.4.c. Center point (circle)

The latitude and longitude of datum are given along with a radius around datum (See Figure 15-5).

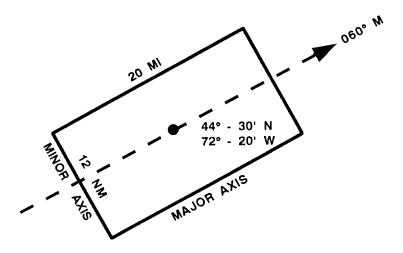




Center Point (Circle) Figure 15-5

E.4.d. Center point (rectangle)

The latitude and longitude of datum are given with the direction of major (longer) axis plus the length and width of the area (See Figure 15-6).

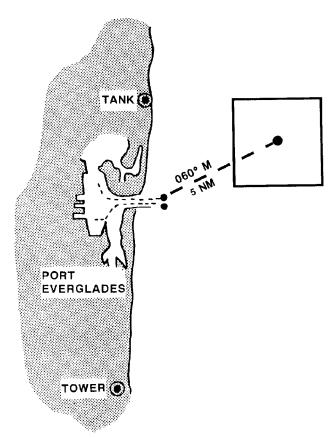


Center Point (Rectangle) Figure 15-6



E.4.e. Center point-landmark (rectangle, bearing & distance)

The center point, or datum, may also be designated by a bearing and distance from some geographic landmark (See Figure 15-7).

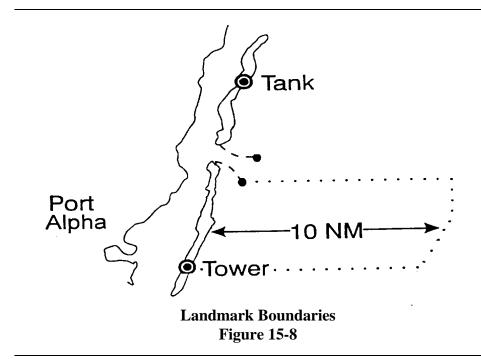


Center Point Method (Rectangle, Bearing & Distance) Figure 15-7

E.4.f. Landmark boundaries

Two or more landmarks are given as boundaries of the search area along a shoreline (See Figure 15-8).







Search Patterns

E.5. General

Once a search area has been determined, a systematic search for the object must be planned. Which is the best search pattern to use?

E.6. Considerations

Consider the following to determine which search pattern to use:

- Weather conditions
- Size of search area
- Size of search object
- Number of search units involved
- Search area location
- Time limitations

E.7. Search pattern designation

Search patterns are designated by letters. The first letter indicates the general pattern group:

- T = Trackline
- C = Creeping line
- \bullet P = Parallel
- V = Sector
- S = Square

The second letter indicates the number of search units:

- S = Single-unit search
- M = Multiunit search

The third letter indicates specialized SRU patterns or instructions, for example:

- R = Return
- N = Non-return



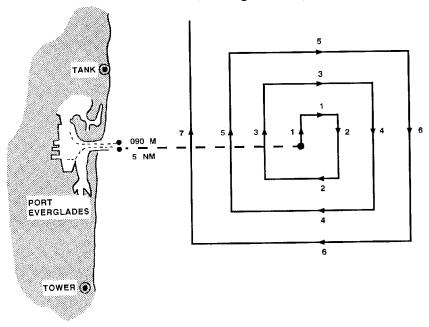
E.8. Types of search patterns

The most common types of search patterns are discussed below. Detailed descriptions of each pattern are available in the *Coast Guard Addendum* to the National Search and Rescue Manual and in the National Search and Rescue Manual.

E.8.a. Square pattern (S)

The **square search pattern** is used when the last known position of a search object has a high degree of accuracy, the search area is small, and a concentrated search is desirable. Sector patterns are good for man overboard searches.

• <u>Square Single-unit (SS)</u>. In the **SS pattern** for boats, the first leg is normally in the direction of the search object's drift and all turns are made 90° to starboard (See Figure 15-9).



Square Single-unit (SS) Figure 15-9

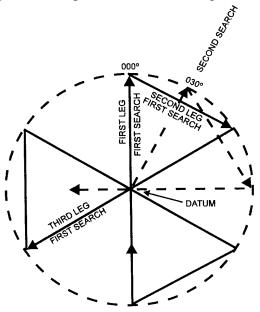
• Square Multiunit (SM) The SM pattern is used when two units are available. The second unit begins on a course 45° to the right of the first unit's course.



E.8.b. Sector patterns (V)

Sector search patterns are used when datum is established with a high degree of confidence but the search object is difficult to detect, such as a person in the water. The search unit passes through datum several times, each time increasing the chances of finding the search object. The pattern resembles the spokes of a wheel with the center of the wheel at datum. Datum should be marked by the first SRU on scene with a Data Marker Buoy (DMB) or other floating object. By marking the center of the search pattern, the coxswain has a navigation check each time the boat passes near the center of the search area (datum). This pattern consists of nine legs. There are two types of sector search patterns.

• Sector Single-unit (VS). The VS pattern is used by a single boat. The first leg begins in the same direction that the search object is drifting toward. All legs and crosslegs of this pattern are of equal length. After running the first leg, your first turn will be 120° to starboard to begin the first crossleg. All subsequent turns will be 120° to starboard to a course determined by adding 120° to your previous course (See Figure 15-10). Notice that after completing the first leg and crossleg, the second and third legs of the pattern are completed in sequence without turning between.



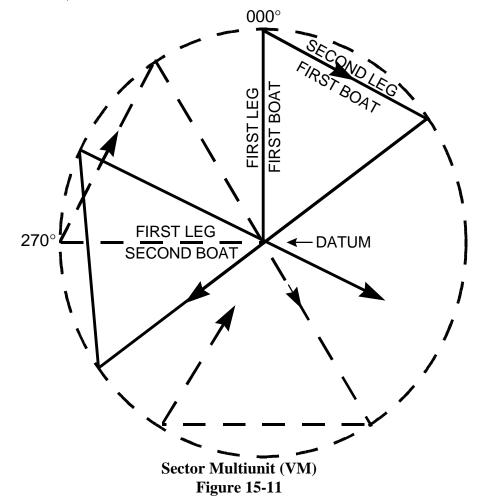
Sector Single-unit (VS) Figure 15-10



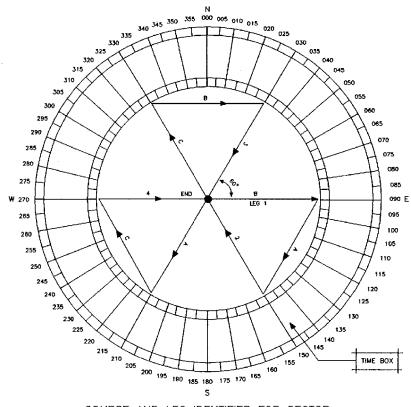
• Sector Multiunit (VM). The VM pattern is used when a second boat is available. The second boat starts at the same datum, but begins the first leg on a course 90° to the left of the first boat. The search is then the same as a VS pattern. The second boat should start the search at a slower speed than the first boat, if both boats start at the same time. When the first boat is one leg ahead of the second boat, the second boat accelerates to search speed. This slow start by the second boat will keep both boats from arriving at the center of the search pattern at the same time (See Figure 15-11).

NOTE &

Course and leg identifiers should be carried in each SRU to calculate courses and times for each expanding square and sector search pattern leg. The course and leg identifiers can be easily obtained through the federal stock system, Stock Number SN 7530-01-GF2-9010 (See Figure 15-12 and Figure 15-13).







COURSE AND LEG IDENTIFIER FOR SECTOR SEARCH PATTERNS - (VS) - 60° CENTRAL ANGLES

TIME AND DISTANCE TABLE

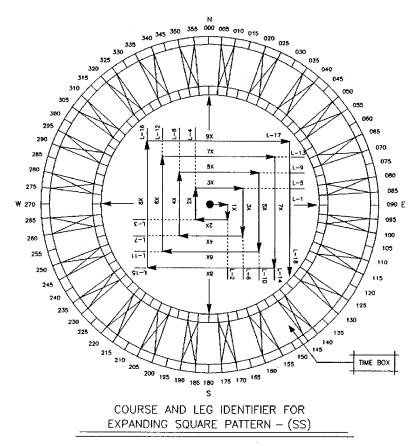
SPEED

					JI LEL	,				
		5Kts	BKts	10Kts	12Kts	15Kta	18Kts	20Kts		
		M:S	⊭;\$	M;S	M;S	M:S	M:S	M:S	-	
	.5	6:00	3:45	3:00	2:30	2:00	1:40	1:30		
	1	12:00	7:30	6:00	5:00	4:00	3:20	3:00] [
S	1.5	18:00	11:15	9:00	7:30	6:00	5:00	4:30	1	
MILES	2	24:00	15:00	12:00	10:00	8:00	6:40	6:00		- 1
3	2.5	30:00	18:45	15:00	12:30	10:00	8:20	7:30	93	Ŕ
7	3	36:00	22:30	18:00	15:00	12:00	10:00	9:00	1 5	종
NAUTICAL	3.5	42:00	25:15	21:00	17:30	14:00	11:40	10:30	MINUTES	SECONDS
ξ	4	4B:00	30:00	24:00	20:00	16:00	13:20	12:00	1 :	
₹	4.5	54:00	33:45	27:00	22:30	18:00	15:00	13:30	;	S
-	5	60:00	37:30	30:00	25:00	20:00	16:40	15:00	_	v
	5.5		41:15	33:00	27:30	22:00	18:20	16:30	1	
	6		45:00	36:00	30:00	24:00	20:00	18:00		
	6.5		48;45	39:00	32:30	26:00	21:40	19:30		
	7		52:30	42:00	35:00	28:00	23:20	21:00		
	7.5		56:15	45:00	37:30	30:00	25:00	22:30	ļ	
	8			48:00	40:00	32:00	26:40	24:00]	
		M:S	M;S	M:S	M:S	M:S	M:S	M:S		

- PLACE LEG NUMBER 1 INDEX ON HEADINGS OF FIRST SEARCH LEG.
- 2. THE LETTERS ON THE CROSS LEGS INDICATE THE NUMBERS PARALLEL RADIAL LEG FOR DETERMINING EACH CROSS LEG HEADING.

Course and Leg Identifier For Sector Search Patterns Figure 15-12





TIME AND DISTANCE TABLE

	SPEED									
MILES		5Kts	8Kts	1QKta	12Kls	15Kts	1BKts	20Kls		
		M:S	M:5	M:S	M:S	M:S	M:S	M:S	1	
	.5	6:00	3:45	3:00	2:30	2:00	1:40	1:30		
	1	12:00	7:30	6:00	5:00	4:00	3:20	3:00	1	
	1,5	18:00	11:15	9:00	7:30	6:00	5:00	4:50	1	
	2	24:00	15:00	12:00	10:00	8;00	6:40	6:00	[
	2.5	30:00	18:45	15:00	12:30	10:00	8:20	7:30	92	, ķ
J	3.	36.00	22:30	18:00	15:00	12:00	10:00	9:00	MINUTES	SECONDS
ō	3.5	42:00	26:15	21:00	17:30	14:00	11:40	10:30	I	끊
NAUTICAL	4	48:00	30:00	24:00	20:00	16:00	13:20	12:00		w
₹	4.5	54:00	33:45	27:00	22:30	18:00	15:00	13:30	,	
-	5	60:00	37:30	30:00	25:00	20:00	16:40	15:00	_	•,
	5.5		41:15	33.00	27:30	22:00	18:20	16:30]	
	6		45:00	36:00	30:00	24:00	20:00	18:00		
	6.5		48:45	39:00	32:30	26:00	21:40	19:30		
	7		52:30	42:00	35:00	28:00	23:20	21:00		
	7.5	L	56:15	45:00	37:30	30:00	25:00	22:30		
	,8			48:00	40:00	32:00	26:40	24:00	l	
		M:S								

- PLACE INDEX (ARROW NUMBER 1) ON HEADING OF FIRST SEARCH LEG. HEADINGS OF ALL LEGS ARE SHOWN BY THE CORRESPONDING PARALLEL INDEX ARROWS.
- 2. RECORD TIME TO TURN IN THE TIME BOX FOR EACH LEG. LEG NUMBERS ARE SHOWN ON LEG EXTENSION LINES.

Course and Leg Identifier For Expanding Square Pattern Figure 15-13

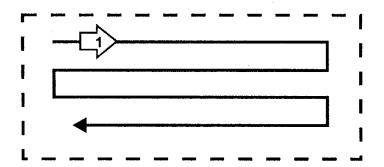


E.8.c. Parallel patterns (P)

Parallel track patterns are used when there is an equal probability that the search object could be anywhere in the search area. It is a good pattern to use when the approximate location of the search object is known and **uniform coverage is desired.** Parallel track patterns are the simplest of the search patterns. You steer straight courses on all legs. Each leg is one track spacing from the other. The legs are parallel to the long side or major axis of the search area. There are two types of parallel track patterns.

The Commence Search Point (CSP) for parallel patterns is located at a point 1/2 of the distance selected as the search track spacing inside a corner of the search area. The first and last search legs then run 1/2 track spacing inside the search area boundaries. This prevents excessive duplicate coverage, eliminates the possibility of leaving an unsearched track at the search area boundary, and gives SRUs in adjacent search areas a margin of safety.

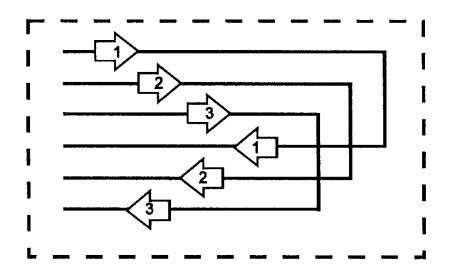
• <u>Parallel Track Single-unit (PS).</u> The **PS pattern** is conducted by a single SRU. The legs of the search are run parallel to the long side (Major Axis) of the search area (See Figure 15-14).



Parallel Track Single-unit (PS) Figure 15-14

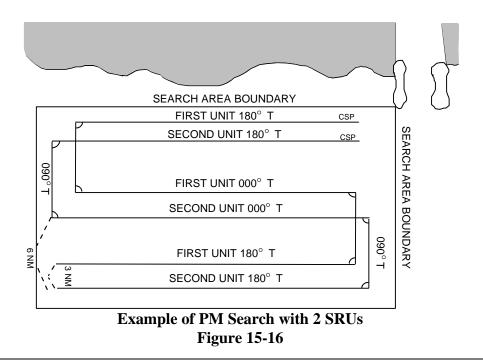
• Parallel Track Multiunit (PM). The Multiunit (PM) pattern is used under the same circumstances as the (PS) but with more than one SRU (See Figure 15-15). The SRUs are separated by a single track spacing. They search parallel to the long side of the search area. After completing the first search leg, they move over a distance equal to the track spacing times the number of SRUs, and then search back on the reciprocal heading of the first leg.





Parallel Track Multiunit (PM) Figure 15-15

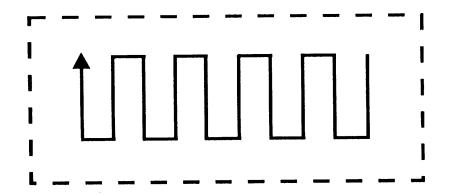
An example of a PM search is provided as Figure 15-16. The search area is from Hunter Inlet South Jetty Light on the north to 30 NM south and 18 NM offshore. Two SRUs are used with a track spacing of three NM and a search speed of 10 knots





E.8.d. Creeping line single-unit (CS)

The **CS** pattern is used when the probable location of the search object has been determined to be **more likely at one end of the search area** than at the other end. Creeping line search patterns are the same as parallel patterns with the exception that the legs are run parallel to the short side (minor axis) of the search area. This pattern's CSP and search legs are also located 1/2 track spacing inside the search area (See Figure 15-17).



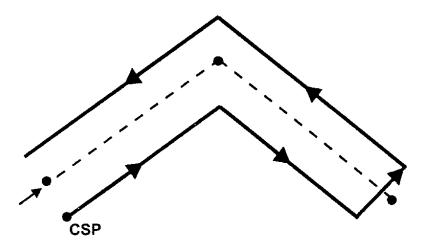
Creeping Line Single-unit (CS) Figure 15-17

E.8.e. Trackline single-unit return (TSR)

The **Trackline Single-unit Return** (TSR) pattern is used to search when the only information available on the missing vessel is the intended track of the search object (See Figure 15-18).

NOTE &

In darkness or extremely low visibility, surface search vessels should periodically stop their engines at selected points in the search area and conduct a listening search for a short period of time, then return to covering their assigned search area.



Trackline Single-unit Return (TSR) Figure 15-18



E.8.f. Barrier

The barrier pattern is used in areas with strong current, such as a river. The search lies along the path of the current. The boat moves back and forth over the same track. This can be done by steering on an object on each side of the river bank. The boat moves from one side of the search area to the other while the current carries the water and objects past the search barrier.

Since river currents can vary across the width of a river, a more effective barrier might be established by forming a line abreast. This is done by placing observers on each bank and a boat in the area of swiftest current holding station between the observers on shore. Additional boats, if available, could be added to the line abreast to reduce the effective track spacing and increase the effective coverage. This technique produces a more effective, and predictable, barrier.



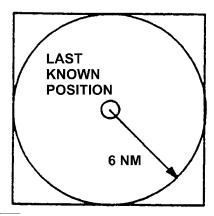
Initial Response

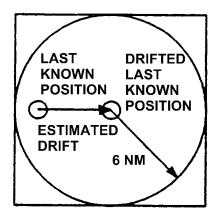
E.9. Search patterns and actions to be used

The simplified patterns and initial search actions recommended in the Coastal search planning section for coastal incidents in the CG Addendum to the National SAR Manual are to be used when an SRU arrives on scene and the object of the SAR incident is not initially seen or located. The following patterns and initial search actions are to be used until a complete search plan has been developed by the SMC.

E.10. SRU actions

Whenever a case occurs which has a SRU on scene and the object of the distress is not immediately seen or located, report the situation to the SMC by the quickest means possible. The SMC will immediately start planning and then develop a search action plan of the SRU. In the meantime, the SRU shall be conducting either an expanding square or sector search using a search radius of 6 NM.





Initial Response Search Area Figure 15-19

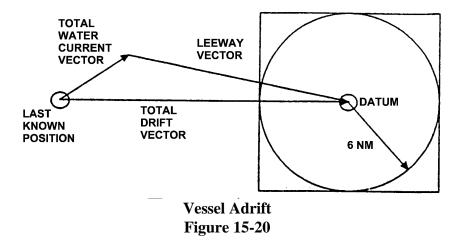
E.11. Initial response search area

If the search object is not located on arriving on scene, the SRU is to assume it is adrift if the distressed boat did not indicate it was at anchor.



Step	Procedure					
1	Draw a circle with a 6 NM radius centered at the last known					
	position (LKP). If drift is considered to be significant, the SRU					
	should estimate the drift based on local knowledge/on scene					
	conditions, and center the 6 NM circle around the drifted LKP.					
2	Communicate and confirm the new datum with the SMC.					
	Remember that the time of datum must take into consideration the					
	underway transit times for the SRU.					
3	Next draw the search pattern within the tangent of the circle.					
	Datum for the search is the commence search point (CSP). Track					
	spacing is from Figure 15-21.					
4	Orient the search area in the same direction of drift, that is, in the					
	same direction as the total drift vector (Figures 15-19 and 15-20).					

If the reported position of the distressed craft is in shallow water, it could be at anchor, and a search down the drift line may be appropriate.



E.12. Keeping the SMC updated

The SRU shall also keep the SMC constantly updated on conditions, findings, and when nearing completion of initial response search. This direction should not preclude a SRU from using an alternate search pattern or area when it is clearly not practical (e.g., narrow waterway or other physical barrier).

E.13. Appropriate search pattern

The preestablished operations and search procedures for the first SRU on scene should be to immediately report to station, or SMC the on scene conditions and findings. Next, begin appropriate search pattern.



E.13.a. Surface SRUs

Usually an expanding square (SS) is used. This is because it concentrates the search closure to datum and usually there will only be a short period of time on the initial response before the SMC gives direction and information for conducting and starting a first search. If the search area is confined or there is reason to have a high degree of confidence for the selected datum (e.g., debris found), the surface SRU may use a sector search (VS). Other search patterns may be used as appropriate.

E.13.b. For Helicopter SRUs

Helicopters are a suitable platform to execute SS and VS pattern searches. Depending on the proximity to the coast and environmental conditions, a radius larger than 6 NM may be appropriate for a helicopter during the initial search due to a higher search speed.

E.13.c. Initial track spacing

Use Figure 15-21 to determine the track spacing for the initial response search by surface or helicopter SRUs.

Search object	Good Conditions Wind < 14 kts	Poor Conditions Wind > 15 kts		
	Seas < 3 ft	Seas > 3 ft		
PIW	0.1*	0.1*		
< 15 ft	0.5	0.2		
> 15 ft	1.0	1.0		

^{* &}gt; 0.1 up to SRUs minimum ability to navigate

Initial Track Spacing (NM) Figure 15-21



Search Area Coverage

E.14. General

Search area coverage considers the area to be searched and the SRUs available to search. Once the search area has been determined and the search patterns selected, the next step is to have SRUs conduct the search. Based on the sweep width, an SRU will be assigned its own part of the overall areas to search. Essentially, your boat will start at an assigned commence search point (CSP), steer the track (search leg), and search (sweep down) on both sides of the boat.

E.15. Sweep width (W)

Sweep width is a distance measured on both sides of an SRU. A sweep width of one mile means ½ mile to starboard and ½ mile to port for a total "width" of one mile. Sweep width is determined by:

- Search object type, size and construction
- Environmental conditions
- Sensor (e.g., visual or radar)

E.16. Track spacing (S)

Track spacing is the distance between adjacent parallel legs within a search area. These tracks may be conducted simultaneously by multiple units separated by fixed intervals, or they may be the result of successive sweeps conducted by a single SRU. Most of the search patterns described in this chapter consist of equally spaced, parallel search legs (tracks). The distance between adjacent search legs is called the track spacing (S). The best track spacing is a distance which permits maximum expectation of search object detection in the shortest period of time.

E.17. Commence search point (CSP)

The **commence search point** is a point normally specified by the SMC for an SRU to begin its search pattern.



Section F. Search Preparations

Overview

F.1. General

NOTE &

In an emergency, this information can be passed to the boat crew while en route to a search area. Before beginning a search, you must collect all available facts about a case. The SMC should provide most of this information as the search action plan. The checklist below will help you determine whether you have everything you need to begin a mission. Once you have collected all available facts and have performed the required search planning, you are ready to get underway.

F.2. Questions

Answers to the following questions will help determine if you have done everything you need to do before getting underway:

What is the object of this search and what equipment do the personnel aboard have?

- How many people are involved?
- What is the assigned search area?
- What are the circumstances of their distress?
- What search pattern will be used?
- What is the desired search speed?
- What special equipment is required?
- What radio frequencies will you use?
- Are other units assigned? If so:
 - What kind?
 - What are their search areas?
 - What are their search speeds?
 - What search patterns will they employ?
 - What radio frequencies will they use?



- Do you have all required charts aboard?
- What are the weather and sea conditions?
- Who is on-scene coordinator (OSC)?
- What unusual circumstances may be encountered? How will you correct for them?

F.3. Brief crew

Crew members must be briefed before getting underway. Make sure all crew members:

- Understand the mission
- Know what they are looking for
- Know where the search will be conducted
- Understand how the search will be conducted



Section G. Conducting A Search

Overview

G.1. General

It is critical that an SRU perform all duties assigned in a correct and predictable fashion. In this case the term SRU includes the vessel, crew, and equipment. Search planners, OSCs, SMCs, and others all make plans based on assumptions they have made. These assumptions are considered when making decisions that could have life and death consequences for someone who may be the object of a major Coast Guard search effort. One assumption made by SAR planners is that the SRU, its crew, and equipment all perform as planned, completing all missions assigned unless advised otherwise.

In some instances, however, SRUs have failed to properly complete their assigned mission. Reasons may include not having proper equipment on board, or a crew member not fully prepared, trained, or qualified, or a failure to complete some task. There have been instances when an SRU failed to fully search an assigned area or, due to careless navigation, failed to search in the area assigned. Actual searches and rescues are typically carried out when conditions are at their worst, making even simple and routine tasks extremely difficult. Accurate navigation, observant lookouts, and trained and knowledgeable crew members can make the difference between successful cases and disasters.

All effort expended to carefully gather key information, to plan the most effective search, or to select exactly the right SRU is wasted if the SRU performing the search or rescue fails to do so in a professional manner to the best of its ability. If not able to complete the search (e.g., equipment failure, poor visibility, or worsening weather), advise the SMC what areas were searched.

Chapter 15: Search and Rescue

